

Implementation of Anti-Retroviral Therapy (ART) Pharmacy Management Information System in Public Health Facilities in Ethiopia

by

MEKDES ALEMAYEHU DERSEH (M A DERSEH)

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Dedication:

DECLARATION

I declare that **Implementation of Anti-Retroviral Therapy (ART) Pharmacy Management Information System in Public Health Facilities in Ethiopia** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before for any other degree at any other institution.

Full Name : **Mekdes Alemayehu Derseh**

November 2013

Student Number : 46352775

Date

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Implementation of ART Pharmacy Management Information System in Public Health Facilities in Ethiopia

STUDENT NUMBER : 46352775
STUDENT : Mekdes Alemayehu Derseh (full names)
DEGREE : MASTER OF PUBLIC HEALTH
DEPARTMENT : HEALTH STUDIES, UNIVERSITY OF SOUTH AFRICA
SUPERVISOR : Prof. S O Okeyo

ABSTRACT

Health Management Information System (HMIS) in developing countries lags seriously behind as compared to the developed countries; and the existing HMIS in many countries is insufficient to support health management functions. The purpose of this study was to describe the implementation of Anti-retroviral Therapy (ART) pharmacy management information system in public health facilities.

Quantitative, descriptive research was conducted at 38 public health facilities. The participants of the study were Pharmacists and Druggists those are working at ART Pharmacy. Data collection was done by using structure questionnaire. 76 respondents were recruited to participate in the study.

The participants ages ranged from 26-50 years and all had more than 2 years' work experience.

The study indicated that even if there is a system at most health facilities their utilization of information technology (IT) for pharmacy practice were not appreciated. The findings indicated that the need for creating awareness among professionals in giving more skill oriented and also a formal in-service information technology related trainings for the professionals. To achieve better utilization of information technology at health care delivery system particularly pharmacy practice, government and stakeholder should consider capacity building activities through proper training and it should also viewed as a long term socio-cultural and technical development process.

Key Words:

HIV/AIDS, Information management, Public Health Facilities, ART Pharmacy, Dispensers, IT usage.

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Abbreviations

AAHB	Addis Ababa Health Bureau
ADR	Adverse Drug Reaction
AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral Therapy
EDT	Electronic Dispensing Tool
FMoH	Federal Ministry of Health
FMHACA	Federal Ministry of Food, Medicine and Health Care Administration and Control Authority
HF	Health Facilities
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
HSDP	Health Sector Development Program
ICT	Information Communication Technology
IT	Information Technology
MoH	Ministry of Health
MSH	Management Sciences for Health
NGOs	Non-Governmental Organizations
PDA	Personal Digital Assistance
PMIS	Pharmaceutical Management Information System
PIS	Patient Information Sheet
RHB	Regional Health Bureau
RPM Plus	Rational Pharmaceutical Management Plus
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
SPSS	Statistical Package for Social Science
UNAIDS	United Nations Aids Program
WHO	World Health Organization

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CHAPTER ONE

ORIENTATION TO THE STUDY

1.1 INTRODUCTION

At the beginning, health information system were oriented only to collect information on disease and health services output, but in contemporary era health information systems are considered to be part of health system; and hold great importance in the planning and decision-making of health care delivery services (*Hiwot 2005:1*). Pharmacy Information System is one part of Health Management Information System. Health information systems generate information to inform health planners and decision makers on what is happening at the delivery facilities. Health Management Information System (HMIS) improves health management; which is pre-requisite for good health care delivery services. HMIS is there to fill the gap between disease occurrences or health problems and the response of the health service providers (*Hiwot 2005:1*).

Over the past 40 years the pharmacist's role has changed from that of compounder and dispenser to one of "drug therapy manager". This involves responsibilities to ensure that wherever medicines are provided and used; quality products are selected, procured, stored, distributed, dispensed and administered so that they contribute to the health of patients and no to their harm. The scope of pharmacy practice now includes patient-centered care with all the cognitive functions of counseling, providing drug information and monitoring drug therapy, as well as technical aspects of pharmaceutical services, including medicines supply management. It is in the additional role of management drug therapy that pharmacists can now make a vital contribution to patient care (***Developing Pharmacy Practice: A focus on Patient Care, South Africa: 2006***).

Accurate, timely health information is essential for countries to monitor health trends, identify unmet needs, invest in important performance improvements, and measure which approaches have the greatest health impact so they can be expanded (www.msh.org).

A good Pharmacy Management Information System provides the necessary information to make sound decisions in the Pharmaceutical sector. Effective pharmaceutical

management requires policy makers, program managers, and health care providers to monitor information related to patient adherence, drug resistance, availability of medicines and patient safety, product registration, financing and program management among other issues (*Management Sciences for Health 2011*).

A successful Pharmaceutical Management Information System (PMIS) is able to synthesize the large volume of data generated by pharmaceutical management operations. It then processes the data into information for use in planning activities, estimating demand, allocating resources, and monitoring and evaluating pharmaceutical management operations.

1.2 BACKGROUND INFORMATION ABOUT THE RESEARCH PROBLEM

1.2.1 The source of and background to, the research problem

Ethiopia is a Federal Democratic Republic located in the Horn of Africa. It is the tenth largest country in Africa, and consists of nine Regional States and two City Administrations. The regions are divided into zones, which are divided in to 624 Woredas (districts) (*FMH – HMN-Eth 2007*). The health status and economic indicators of the country are among the poorest in the world. The population size of Ethiopia is more than 83 million in mid-2007.



Figure 1.1: Ethiopia Administrative Region

(Source: FMOH; Map not to scale)

Currently, Ethiopia is implementing the third Health Sector Development Program (HSDP) and one of the major components of HSDP is HMIS and monitoring and evaluation. The primary aim of HMIS is to support informed strategic decision making by providing quality data that help managers and health workers plan and manage the health service system. There have been repeated efforts to reform HMIS in Ethiopia. The Federal Ministry of Health considering the crucial role that HMIS would play in the successful implementation of HSDP's strategic plan (*Federal Ministry of Health, HMIS Reform Team 2008*).

According to the most recent estimates, about 2 million people were living with HIV in Ethiopia in 2011. With an estimated adult prevalence of 1.5%, it has a large number of people living with HIV (approximately 800,000); and about 1 million AIDS orphans. In the same year, more than 350,000 people needed ART. A free ART program was launched in early 2005. Subsequently, ART services have been decentralized and made available at increasing number of both health centers and hospitals since August 2006 (*Federal Ministry of Health, HMIS Reform Team 2008*).

At all levels the health delivery structure a well-organized health information system is vital for identifying the health needs of populations and for planning and implementation and monitoring of health interventions.

Health Management Information Systems are important support tools in the management of health care service delivery in both developed and less developed countries. It is an information system designed to assist in the management and planning of health programs as a proposed delivery of care. In developing country like Ethiopia health information system often does not go beyond collecting and recording health related data or information (Hiwot 2005:3).

In developing countries, healthcare information systems have been driven mainly by the need to report aggregate statistics for government or funding agencies (Informatics in Primary Care: 2005).

However, in Ethiopia, MSH/SIAPS (Strengthening Improved for Access pharmaceutical Services) project, it is funded by USAID works in a number of developing countries to provide technical assistance to strengthen drug and health commodity management systems. MSH/SIAPS project assists in developing strategies and implementing programs aimed at improving the availability of health commodities of assured quality and promoting the appropriate use of health commodities in the public and private sectors.

MSH/SIAPS provide technical assistance to strengthen pharmaceutical and health commodity management system. To strengthen the pharmacy service, the program developed a simple Microsoft Access based electronic tool for pharmacy staff to use to track patients and drugs inventory. The ART Electronic Dispensing Tool which enables pharmacists to track medicines dispensed, drug stock levels, number of patients served, and consumption records that are needed to quantify pharmaceutical needs and to make other program management decisions purposes. The program offers technical guidance and assists in a strategy development and program implementation both in the availability of health commodities, pharmaceuticals, vaccines, supplies (computers and accessories) and basic medical equipment of assured quality of health care services like HIV/AIDS, infectious disease and in promoting the appropriate use of health commodities in the public and private sectors (*MSH-PMIS-2011*) & (*MSH-website-www.msh.org*).

The USAID-funded SIAPS program routinely monitors ART patient-uptake and drug treatment regimen data from more than 800 ART pharmacies throughout Ethiopia with the help of electronic and manual dispensing tools (*<http://evidence-based-information-from-pharmacies-improves-art-guidelines/>*).

The Electronic Dispensing Tool is intended for people managing products used in the fight against HIV/AIDS infection. And for the future there is a plan to use this tool for other endemic or epidemics, such as TB and Malaria. It allows a file to be managed for each patient to whom medicines are dispensed at a pharmacy in a facility providing Antiretroviral Therapy (ART) for people living with HIV. Each patient's file includes his or her basic profile and products administered (*ART Dispensing Tool User guide, August 2007*).

The pharmacists can pull up this at the same time medicines are dispensed. This tool is also useful in generating reports containing basic statistical data and information that can assist for monitoring of a patients and their adherence to the prescribed treatment and needed to calculate pharmaceutical needs and to make other management decision. This tool helps to maintain basic patient profile information, medication history, and other data that are essential for the dispensers to know at the time of dispensing. In addition to this, the tool is used for to manage expired drugs by using expired date and batch number (*ART Dispensing Tool User guide, August 2007*).

Through the use of such system, pharmacists can supervise and have inputs on how medication is used in a health facility. It is either a standalone (a pharmacy department computer with pharmacy information which is not linked to any department) or integrated system i.e. pharmacy department computer linked to other departments like drug store or clinical computer system and patient, drug and clinical information readily available to all permitted members of the health facility.

1.3 RESEARCH PROBLEM

The Ethiopian National Health Information System assessment report of 2007 identified that the health management information is among the major problems of the sector. It is characterized by uneven and inadequate staff skill and the information flow is also fragmented and characterized by parallel reporting system with no integration among the various subsystems. This resulted in redundant and conflicting reports and poor quality of data in terms of accuracy and timelines (*FMOH-2007-HMN-ETH*).

Pharmaceutical management system at health facilities in Ethiopia is reportedly so poor that the system in place does not allow for the effective and efficient monitoring that is required to manage antiretroviral (ARV) drugs. The processes of selection, quantification, procurement and ordering, distribution, and use were not uniform throughout the country's health facilities. The drug management information system operating at facility level was so minimal that the information obtained was of little importance or support for decision-making purposes. Activity reporting was usually not complete enough to provide the information required to address pharmaceutical supply management problems.

Moreover, in Ethiopia there was no tradition of keeping patient information in the dispensing pharmacy at all health facilities. The importance of such information becomes evident when a patient needs follow up on the particular pharmaceutical treatment. But at the beginning of ART service in Ethiopia, pharmacists have not been involved in following up of treatment outcomes, development of adverse drug reactions (ADRs), side effects or allergies, or in other issues related to the medications. The only way that the patient could get support in such situations is if he or she goes back to the prescribing physician because most patients are not aware that the pharmacist can help them.

The pharmacist can, however, assist both the patient and the physician in many aspects related to medicines. Use of pharmacists in this role can reduce significantly the number of unnecessary repeat visits to the physician for minor problems that can easily be handled by the pharmacist. This allows the physician to concentrate on patients with complicated cases. In addition, the patient saves time because he or she can get support from the pharmacist, who is easily accessible. The input of the pharmacist could, however, be substantial if he or she had access to basic information about the patient's history. If such information is recorded and filed at the dispensing pharmacy, the pharmacist can offer an appropriate and informed recommendation about the treatment based on the basic data available about the patient.

Most pharmacies are providing healthcare services to a large number of clients/patients and the drug dispensing professionals rely on manual system on handling drug and patient information. This is time consuming and sometimes ends up in serious medication errors due to human errors. As patient load at ART health facilities increasing from time to time, searching patient cards (PIS), dispensing drugs, follows up of patient status, and generating activity report manually became difficult or time consuming.

However, using computers or information technologies decrease dispensing errors, improve efficiency and effectiveness of organizations performances. Consistent use of this technology improves health care quality, prevent medication errors, reduce health care costs, reduce patient waiting time, increase administrative efficiency, decrease paper work, and expand access to affordable care (*Bates, Leape, cited by Tesfaye Gebre 2010*).

Though technology has advantages, there are some barriers such as lack of computer skills of the dispensers, lack of motivation to use technologies; they feel like as an additional work and lack of access to use information technology. Generally there is technical, financial and professional challenges facing pharmacy practice to introduce IT (*Godlee & Pakenham – Wash 2004*).

Currently, it is assumed that the magnitude of the use of this technology by pharmacists and druggists is little known in the practice of pharmacy in Ethiopia, particularly in Addis Ababa. The study tried to answer the question “do pharmacists and druggists, who are the members of the health care system, particularly in the medication dispensing process, take advantage of information technology in their drug dispensing practice”? And to assess the advantage of using PMIS and factors that affect to use HMIS in pharmacy practice.

1.4 AIM OF THE STUDY

1.4.1 Research purpose

The purpose of the study is to assess the ART Pharmacy HMIS in Addis Ababa Region with a view to recommending improvement of pharmacy services.

1.4.2 Research objectives

- To determine the availability and utilization of information technology system at health facility level
- To identify factors that affects the adoption, utilization and implementation of health information system in the health facilities pharmacies.

1.5 SIGNIFICANCE OF THE STUDY

The need for better health information is vital in the age of globalization. Advancement in information technology is having a great impact in the field of pharmacy, particularly affecting physicians, patients, pharmacists and hospital management in many ways. The findings and recommendations of the study will contribute towards the ongoing efforts of developing better health management information system in the country in general and in Addis Ababa in particular because the outcome of this study may provide exploratory baseline information for future studies and practice regarding pharmacy professionals and this may also provide information for the ongoing health management information system.

The study will benefit the pharmacies by providing information to improve the services they provide. This may give them a highlight of delivering effective and efficient healthcare for their patients. In addition to this, it may help them to know the technical, financial and professional challenges facing pharmacy practice to introduce IT. From the study, they may understand and devise a solution to overcome the constraints that hinder them to utilize the potentials or advantages of information technology. In line with this, the findings will also provide baseline information for health facility administrators in planning ongoing computer training for pharmacists and druggists.

1.6 DEFINITIONS OF TERMS

Pharmacy Management Information System: It integrates pharmaceutical data collection, processing, and presentation of information that helps staff at all levels of a country's health system make evidence based decisions to manage pharmaceutical services (MSH – PMIS-2011).

Computer based Information System: *is a set of elements working interactively to gather and process input and distribute output information which improves day to day operations.*

System: *A collection of components that work together to achieve a common objective (WHO 2004).*

Information System: *A system that provides information support to the decision making process at each level of an organization (Developing Health Management Information System: WHO 2004).*

Health Information System: *A system that integrates data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services (WHO 2004).*

Health Management Information system: *An information system specially designing to assist in the management and planning of health of health programs, as opposed to delivery of care (WHO 2004).*

1.7 FOUNDATIONS OF THE STUDY

Ethiopia has an estimated 2 million people living with HIV and the third highest number of infections in Africa, according to UNAIDS. With a population of 83 million people and per capita income of less than US\$ 100 annually, it is also one of the world poorest countries.

Systems that enable patient tracking, clarify patient flow and allow patient follow-up are essential for safe care and continuity of care. At a minimum, there must be a medical record system. Patient information must be documented by all disciplines (Physicians, nurses and pharmacists) that provide direct patient care. This system should also allow for timely information exchange between disciplines on the patient flow chart. This system is the foundation, not only for patient care but also for monitoring and evaluation and patient referrals.

1.7.1 Meta-theoretical assumptions

The study is descriptive quantitative study which is based on conceptual framework.

1.7.1 Theoretical framework

The theoretical framework provides a general representation of relationship between things in a given phenomenon. The conceptual framework, on the other hand, embodies the specific direction by which the research will have to be undertaken.

A conceptual framework is an organized way of thinking about how and why a project takes place and about how we are understands its activities

This study is based on the concepts of the implementation of pharmacy information management system at Health Facilities

The study evaluated how pharmacy personnel's perceive the effects of the pharmaceutical information system.

Questionnaires were used as an instrument to measure these concepts which were assessed and discussed within the context of implementing information management system at ART pharmacy.

1.8 RESEARCH DESIGN AND METHOD

A quantitative descriptive research design was used for this study. The dimension of the study is quantitative and cross sectional. The study population was pharmacy professionals working at ART pharmacy in Addis Ababa Health Facilities. The study sample was selected from this population.

1.9 SCOPE OF THE STUDY

This study was conducted at 38 ART health facilities in Addis Ababa region, but it did not cover private and other region ART sites, which might limit the generalization of the results. The number of dispensers was limited and therefore a more representative population sampling was not feasible.

1.10 STRUCTURE OF THE DISSERTATION

The structure organization of the thesis shows how chapters are arranged in the dissertation and design the scope to be covered by each chapter. This research is reported in five chapters as follows:

Chapter One introduces the orientation to the study. An overview and introduction of the research study.

Chapter Two discusses the literature review conducted on the research topic in terms of sources consulted on the topic and research methods used.

Chapter Three discusses the research design and method followed to conduct the study. The type of design, the population and sample, the sampling procedures, data collection and analysis and instrument used are discussed.

Chapter Four presents the analysis, presentation and description of the research results, and an overview of the research findings.

Chapter Five details the summary and interpretation of the research findings, makes conclusions, contributions and recommendations from the findings and discuss the limitation of the study.

1.11 CONCLUSION

This chapter outlines the project to explore and describe the implementation of management information system at public health facilities ART pharmacies in Addis Ababa. The problem is, even if there is a computerized system at pharmacies, most professionals are not using computers or electronic dispensing system for real time dispensing, i.e. there is no consistent use of electronic system at pharmacy.

The purpose of this study is to assess the ART Pharmacy HMIS in Addis Ababa Region with a view to recommending improvement of pharmacy services.

The chapter indicates what the investigator intended to study in the problem and objective sections, and how undertook this study in the design and methods section, and how design validity, and reliability of the research instrument were assessed.

Since the study involves human subjects, protection of human rights is detailed in this chapter. The rights of the institution are also protected and scientific integrity is maintained. Finally, the scope and limitation of the study are discussed.

The next chapter described the literature review part that was reviewed, how the review was done. The main concepts are then discussed in detail with reference to the relevant sources.

The following chapters give details on the outline drawn in the current chapter. Methods and the explanations for choosing such methods are described, how the study was conducted, and results and conclusions resulting from the outcomes are discussed. Finally, recommendations are made regarding further research coming from the findings made in the current study.

CHAPTER TWO

LITRATURE REVIEW

2.1 INTRODUCTION

The emergence of the HIV epidemic is one of the biggest public health challenges the world has ever seen in recent history. In the last three decades HIV has spread rapidly and affected all sectors of society- young people and adults, men and women, and the rich and poor. Sub-Saharan Africa is at the epicenter of the epidemic and continues to carry the full brunt of its health and socio-economic impact. Ethiopia is among the countries most affected by HIV epidemic. Ethiopia has shown commitment to prevent its spread and mitigate its impact. To this end, it has rallied support from national and global partners, including mainstreaming of HIV prevention programs to public and private sector businesses, and engagement of community-based organizations. During the earlier years, the government adopted a national AIDS policy and developed and implemented several effective strategies.

Pharmaceutical management system at health facilities in Ethiopia is reportedly so poor that the system in place does not allow for the effective and efficient monitoring that is required to manage antiretroviral (ARV) drugs. The processes of selection, quantification, procurement and ordering, distribution, and use were not uniform throughout the country's health facilities. The drug management information system operating at facility level was so minimal that the information obtained was of little importance or support for decision-making purposes. Activity reporting was usually not complete enough to provide the information required to address pharmaceutical supply management problems

This chapter presents a search and review of literature on the assessment of ART pharmacy Management Information System,

2.2 Role of Information Technology

Information is the lifeblood of any organization, and computer based information system consists of data, hardware, software, telecommunications, people, and procedures. Computer based information systems are excellent tools for collecting, storing, and presenting facts. In fact, information technology is a critically important set of tools for

working with information and supporting the information and information processing needs of any organization. Information technology saves time and overcomes the problem of place to retrieve information while it improves effectiveness and efficiency of performances. Wireless technology allows us a great deal of advantages. For instance, as stated (MSH:2011) portable computers such as Personal Digital Assistants (PDAs) can be used to answer drug related information on spot after installing the necessary software on to the PDA. With the help of PDAs, pharmacists can readily answer questions and help to speed up appropriate patient care services. Internet removes boundaries and the limitations of time. The help of these technologies, one can access any information from one part of the globe to the other end without time and place constraints.

There were times when many quality pharmaceutical reference books from which to choose, but they were nearly all in book format. These resources are now being slowly converted into an electronic format. Some book publishers merely display their books electronically without change. Publishers have progressed from books, to floppy disc-based, to CD-ROM based, to Internet based, and to PDA based products. Nowadays, someone is able to acquire information and communicate his knowledge from anywhere. Technology now allows pervasive computing in pharmacy practice. However, the status of IT in pharmacy practice among pharmacists and druggists is little known in our country.

Exploiting these advantages of technology is open for everyone. However, this seems not easily achieved in developing countries like Ethiopia unless some conditions fulfilled. Because in a document (MOH webpage from www.fmoh.gov.et assessed on 2nd Sept, 2012) it had been noted that lack of access to information remains a major barrier to knowledge-based health care in developing countries and so as fill this gap, they had indicated a universal access to information for health professionals as prerequisite for meeting the Millennium Development Goals and achieving Health for All. To meet this goal, they further considered that significant problems to overcome in some countries include inadequate power supply; lack of computer equipment and information technology support; lack of computer skills; and resistance to use the technology among health professionals.

2.3 Pharmacy Information System

An information system is a set of interrelated components that collect, manipulate, store and disseminate data and information and provide a feedback mechanism to meet an objective. We interact with information systems everyday both personally and professionally. Knowing the potential of information systems and putting this knowledge to work can result in a successful career, organizations that reach their goals, and a society with a higher quality of life.

Pharmacy information system has the advantage of providing functions such as medication dispensing, inventory control, billing of medication, drug information provision, and drug interactions notifications.

The following are some functions that pharmacy information system can provide for pharmacy department (MOH, Implementation of ART program in Ethiopia: 2007).

Prescription Management: It can be used to manage prescriptions for inpatients or outpatients. When drug dispensers receive prescription orders, this is matched to available pharmaceutical products and then dispensed accordingly taking into consideration whether the patient is an outpatient or inpatient. It is possible to track all prescriptions passed through the system. In pharmacy practice it helps to reduce medication error through its built error detecting programs.

Inventory Management: When drugs are dispensed manually, it is very difficult to maintain accurate inventory. However, pharmacy information systems aid inventory management by maintaining an internal inventory of all pharmaceutical products, providing alerts when the quantity of an item is below a set of quantity and providing an electronic ordering system that recommends the order of the affected item and with the appropriate quantity from approved suppliers. It also helps to indicate if there are leaks from a stock. At any time it is possible to know the medicine stock level.

Patient Drug Profiles: When used in a hospital setting, the system manages patient drug profile, that is, it contains details of current and past medications used by the patient, known allergies and physiological parameters. Anytime a prescription is ordered for the patient, these profiles are used for clinical screening.

Patient Monitoring: The routine collection, compilation and analysis of data on patients over time and across service delivery points, using information either directly from paper forms or entered into a computer. These data are best collected and stored at the health facility, and include basic patient demographic characteristics and contact information; information related to patient HIV care and ART history; and patient encounter information collected at each visit. Patient monitoring is often referred to as “patient tracking”. Patient monitoring provides important information for patient management, both of individuals and groups of patients (WHO: Monitoring HIV services, patients and programs: 2008: 96).

Patient Management: The relationship between providers on a clinical team and the individual patient over time, assisted by written records. Patient management may also be referred to as “clinical management” or “clinical monitoring”.

Report Generation: Most systems can generate reports such as medication use patterns, number of patient, the amount of drug dispensed and so on. Report generation takes a lot of time if a manual system is used. Timely and accurate report generation is one of the advantages of this system.

Interactivity with other systems: When a pharmacy information system is a component of a hospital information system, it is important that pharmacy information system should be able to interact with other available systems such as the clinical information systems to receive prescription orders and financial information system for billing and charging.

To exploit these opportunities, drug professionals should possess some knowledge of computer skills, but the current status of pharmacists and druggists in the use of pharmacy information is unclear. Currently, the utilization of the pharmacy information system is known among some pharmacists and druggists the rest are still stick on manual recording system.

If the pharmacy is in the hospital it can be integrated with the hospital information system and through that it can interact with the rest of the departments in that hospital. In an integrated system, each departmental system communicates with the other systems through either a centralized network or distributed network.

Due to inadequate integration, there has been an overlap in the flow of information; inadequacy/incompleteness of information that is collected; and poor analysis and use of the information. This has in turn led to gaps in knowledge on the impact of interventions; duplication of efforts; and huge transaction costs in terms of time spent to produce reports. A well-coordinated HMIS calls for the integration of data from all data sources and other management systems with the benefit of better management of data; dissemination and use; reduced duplication of efforts; and lesser transaction costs (Kim. G 2008:15).

2.4 Overview of Information Technology in Health Services in Ethiopia

According to Ball, MJ, and Handler, recognizing the potentials of information technology in improving health services, the Ethiopian government has issued an information technology policy. The goal of the policy concerning health is to modernize and expand improved health service coverage using IT. The government has stated to commit itself to a nation-wide application of ICT for health service delivery and the following are some of the specific objectives:

- To establish a general database of health information center and dissemination center and disseminate information aimed at improving health service delivery, coverage and quality across the country.
- To introduce a health-net program for health professionals to keep abreast of developments on disease and their cures.
- Linking hospitals, health research institutes and health centers with information network at the federal and regional levels.

Among the strategies, one is creating an electronic information networking for rapid access by health professionals throughout the country on health and pharmaceutical information.

The government of Ethiopia has already known the competitive advantage of information technology so that it is putting every effort to exploit its benefits. To cite few instances, among the working areas for which attention is given was education (schoolnet) and administrative (woredanet) parts and Ministry of Health is also working so as to introduce Health Management Information System in the health sectors.

In addition, there are also some beginnings for the use of pharmacy information system in our country. For instance, the Rational Pharmaceutical Management (RPM) plus program (Rowell Daniels & Thomas Brown: 311-345) currently called Systems to Improve Access for Pharmaceutical Services (SIAPS) which has been working in Ethiopia since 2003 in HIV/AIDS program in collaboration with USAID/Ethiopia is using this system.

MSH/SIAPS (previously called RPM Plus) introduced a pharmacy information system for the use of antiretroviral drugs. They are implementing the electronic ART dispensing tool which enables health care workers to track medicines dispensed, stock levels, number of patients served, and patient treatment information. The tool generates drug consumption and stock on-hand reports needed for drug quantification and distribution at national and regional level. However, lack of computer skills have been mentioned by RPM plus as a challenge.

Another promising point that can reduce the above mentioned challenges is that strong government interest to strengthen the Ethiopian Health Information System can be considered as one opportunity for future development. One of the areas where the government has committed to bring about considerable improvements is communication. Accordingly, the government of Ethiopia has recently embarked on a project to network all regions and woredas using a combination of fiber, microwave, wireless, and satellite technologies, while at the same time, expanding the mobile network rapidly. This is expected to contribute to better communication and information system including health information.

Ethiopian national drug registries are rated as extremely useful if the World Health Organization could offer preferred generic e-Health tools as generic prototypes for adaptation. However, in the same document it is noted that a significant challenge in building IT capacity in the health sector is the information and communications technology illiteracy of graduates and this was thought to limit the promotion of access to electronic health brings awareness to the use of IT (Global Observatory for eHealth - Ethiopia / http://www.who.int/goe/data/country_report/eth.pdf) pp 119.

2.5 Internet skill and Access

More than ever before organizations all over the world are focusing on information as a key resource and to fulfill this purpose, it is understood that information technology use such as Internet enables healthcare organizations and drug professionals in getting the right information into the hands of the right people at the right time. It is stated that health information technology has the potentials to improve the quality of healthcare, reduce medication errors and adverse effects.

The internet has made many things possible. The Internet is a global network of networks which makes vast amount of information available, such as online libraries, reference works, medical databases, and online shopping. The World Wide Web (WWW) is the part of the Internet that is most accessible and easiest to navigate. The Internet and the Web provide an enormous amount of information.

Unless drug professionals, particularly druggists and pharmacists who are practicing in the drug dispensing operations understand the skill and importance of Internet, they cannot exploit the potentials of this technology. According to one survey (www.pharmacure.unibas.sc/zehnder. Accessed on 27/09/2012), the use of Internet in community pharmacies was shown that about 88 percent at least one personal computer connected to the internet and out of this, 47 percent of drug orders, 90 percent for e-mail, 41 percent for pharmacy homepage. 89 percent for drug information and 14 percent was for electronic commerce. From this study one can clearly see that the computers connected to the internet were mostly utilized to obtain drug information and used for e-mail purposes. Besides this, the pharmacists were requested for their future perspective of Internet and 87 percent of them assumed that in the future, the internet will be indispensable tool for a community pharmacy.

Drug related counseling is of growing importance in daily pharmacy practice and the availability of appropriate resources of drug information is essential. One of such resources that provide drug information is the internet. It is suggested that in addition to the traditional sources of drug information, new technologies like internet are becoming more and more important tools in the daily practice of pharmacy. Pharmacists and

druggists need to adapt these new methods to remain the primary specialists for providing drug information to consumers as well as other health care professionals.

As one study conducted (Tefera 2008:231-237) in one region of Ethiopia indicate, 80% of the dispensers said that they do not get up-to-date information about drugs and 60% of them are limited only to inserted leaflets that come with drugs as source of drug information. However, it is known that internet is readily valuable tool in acquiring drug related information. The magnitude of the utilization and access of internet by pharmacists and druggists is little known in the practice of pharmacy in Ethiopia particularly in Addis Ababa. Thus, utilization of Information Technology by pharmacists and druggists needs study.

2.5 Conclusion

This literature search has revealed the existing knowledge base on health or pharmacy management information system. The sources were reviewed to determine the strength and knowledge gap that exists in this field.

The strength of Pharmaceutical Management Information System(PMIS) have been investigated, and even though it has been shown to improve the quality of patient care there have been failures in the implementation of this system at pharmacy, due to lack of motivation, workload and lack of access to IT. User acceptance is critical for successful implementation of PMIS and utilization of IT. The objective of the study is to address the identified gaps. The users of pharmacy information system observe the advantage of the system to manage patient and drug related information.

Managing ART patients and relating information by using paper based recording system is tiresome with the growing of the number of patients. Implementing Pharmacy Management Information System at health facility level needs coordination of HFs and RHBs.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

This chapter discusses the study's research design and methodology. The chapter further outlines population and sampling methods that were used; the data collection and analysis methods implemented; ethical considerations, internal and external validity and reliability. The purpose was to assess the implementation of ART pharmacy information management system at health facilities. The variables were measured using a questionnaire applied to users of the system.

3.2 RESEARCH DESIGN

Joubert and Ehrlich (2007:77) refer to a study design as the structured approach followed by researchers in order to answer a particular question.

The study used mainly the quantitative research methods. Quantitative research is used to measure attitudes, opinions and behavior, it is structured research instruments and all respondents are asked the same questions. And also it involves manipulation, or systematic aggregation of quantities of data.

Quantitative research is generally geared towards documenting subject attributes expressed in quantity, extent, or strength, as well as guaranteeing—among other things, objectivity, accuracy, validity and reliability. Their purpose is to measure variables and to produce figures which will allow judgments as to the status of variables in question, which in turn will allow further processing, and comparisons and permit explicability (Sarantacos 2005 :50).

Quantitative, descriptive survey design was chosen for this study and this subsequent methodology selected.

Quantitative method is used to collect and analyze numerical data obtained from formal instruments i.e. descriptive research. In descriptive research, data collects in order to answer questions about the current status of the subject or topic of the study. And use formal instruments to study, preferences attitudes, practices, concerns or interest of a sample. Cross-sectional survey will be used. Cross-sectional survey involves collecting

data from selected individuals in a single time period however long it takes to collect data from participants (Educational Research- Richard M).

Quantitative research is a formal, objective, systematic process in which numerical data are used to obtain information about the world.

This research method is used:

- To describe variables;
- To examine relationship among variables;
- To determine cause-and-effect interactions between variables (Burns & Grove 2005: 23) Burns, Grove (2005). *The Practice of Nursing Research: Conduct, Critique, and Utilization* (5th Ed.). St. Louis, Elsevier Saunders.

3.3 RESEARCH METHOD

Research is a process of enquiry and investigation; it is systematic, methodical and ethical; research can help solve practical problems and increase knowledge (*Introduction to research 2007:1*).

3.3.1 Population

Population is the universe of all units or elements to which we want to generalize (Stommel & Wills 2004: 297). The study population in the current study was Pharmacists and Druggists who are working on ART Pharmacy at public health facilities.

The target population is the entire set of individuals or elements who meet the sampling criteria (Burns & Grove: 2005). In this study the target population refers to all pharmacists and druggists who are working at ART pharmacy in 38 government health facilities in Addis Ababa Region.

3.3.2 Data collection

Data collection refers to the gathering of all information that is relevant to the research questions or hypothesis as stated by Stommel & Wills (2004: 363). The researcher discussed the data collection approach and methods, the development and testing of the data collection instrument and its characteristics and also the data collection process and ethical considerations related to data collection, data analysis and validity.

In this study self-administered structured questionnaire was used to get the response about the use of information technology for pharmacy services by pharmacists and druggists and there was no personal and social information collected from human data source and there was no physical examination.

Structured questionnaire were developed to collect data. The questionnaire includes a list of questions which was answered by the respondent, and which give indirect measures of the variables under investigation and it is generated by combining researcher's idea those adopted from studies and pre-tested in prior to the actual study period.

The data collection instrument was structured self-administered questionnaire which contained multiple choice questions. The questionnaire was prepared in English.

The data collectors were selected based on the experience working in the field and trained in managing the specific questionnaire and on the importance of confidentiality, anonymity and privacy. The questionnaire distributed for all pharmacists and druggist who are currently working at ART Pharmacy. They filled the questionnaire during their spare time by reading the questions and select the best answer at their work place or at home. Anything that was not clear on the questionnaire was answered by the data collector when they return the questionnaire.

3.3.3 Ethical considerations related to data collection

The study was reviewed and approved by UNISA Ethical Clearance Committee (ethical clearance number-HSHDC/103/2012), subsequently reviewed and approved by Regional Health Bureau (Ref: A.A.H.B/3576/227). A support letter from Regional Health Bureau were obtained and provided to each health facility in Addis Ababa Region. To get the support letter the researcher has go to the Regional Health Bureau and contact the concerned committee in person and describe the intent of the research and assure the confidentiality of the information that will take from health facilities. After the permission is granted the participants contacted and a written consent form provided with each questionnaire to be read by the respondent before they start to fill the questionnaire. And also the participants assured of confidentially and the right to withdraw.

1. Autonomy: The respondent has a right to decide to participate on the study or not. The institutions also have a right to allow the researcher can study at the institution or not.
2. Justice: The participants informed that there is no direct benefit or there is no payment from the study. The researcher treated the respondents equally.
3. Goodwill & non-maleficence: Questionnaires were distributed to the respondents, who signed informed consent form, working within the parameters of ethical standards. Make sure all concerned pharmacy personnel's participated and the researcher asked their voluntary participation and assured there is no harm.
4. Confidentiality and privacy: The researcher assured for the confidentiality of their responses by anonymity of the responses i.e. the name of the respondent does not appear on the questionnaire. The researcher is not expected to ask personal and sensitive questions and avoid violating privacy. The researcher approached with respectful manner and waits their appropriate time to complete the questionnaire.
5. Fairness: The participants treated equally by utilizing the entire population, use the same questionnaire and provided enough information.
6. Protecting the right of the institutions: The health facilities will receive a formal letter before the participants contacted.

Due to the fact that the respondents in this study work at ART pharmacy with HIV positive patients some psychological discomfort was anticipated and there was some discomfort on the participant due to their busyness.

3.3.4 Data analysis

Data analysis entails categorizing, ordering, manipulating and summarizing the data, describing them in meaningful terms (brink 2006:170), and qualifying and statistically reducing raw data in order to draw interpretations and conclusions (UNISA 2008: 99).

The study is mainly quantitative in nature and therefore mostly used statistical strategies. Statistical methods enable the researcher to reduce, summaries, organize, manipulate, evaluate, interpret and communicate quantitative data (Brink 2006: 171), The basic summary is the first step of statistical analysis (Joubert & Enhrilch 2007: 135).

Since the purpose of description of variables, descriptive of variables, descriptive statistics dominated the data analysis. Descriptive statistics are used identify and classify the elements or characteristics of the subject (Introduction to Research and Research Method).

3.4 INTERNAL AND EXTERNAL VALIDITY OF THE STUDY

- **Internal validity**

Internal validity refers to the extent to which the research design impacts on the research outcomes. Internal validity checks ensure that the findings of the research have not been affected by instruments or procedures, and those are the results of the independent variable (Sarantakos 2005: 85).

As the researcher will use the total target population for the study there is no bias

As the population size becomes smaller than 300, it is recommended that total population be used.

(<http://uregina.ca/~morrisev/Sociology/Sampling%20from%20small%20populations.htm>)

- **External validity**

External validity refers to the extent to which research findings can be generalized, and is mostly relevant to explanatory studies (Sarantakos 2005: 85).

External validity is threatened, for example, when the investigator attempts to apply the findings of the study to a population which is not comparable to the population in which the research was completed.

External validity is the extent to which we can generalize the findings to a larger group. This research covers only one region i.e. Addis Ababa, but the findings can be applied to other region HFs in Ethiopia.

DATA GATHERING INSTRUMENT

- **Reliability**

Refer to the capacity of measurement to produce consistent results. Reliability is equivalent to consistency. Thus, a method is reliable if it produces the same results whenever it is repeated, and is not sensitive to the researcher, the research conditions or the respondents (Sarantakos 2005: 88).

In order to maintain a consistent background among the respondents, it is decided that they will be pharmacists and druggists who are working at public health facilities ART Pharmacy. The same questionnaire will be distributed to all the respondents.

- **Validity**

It is the property of a research instrument that measures its relevance, precision accuracy. Validity tells the researcher, whether an instrument measures what it is supposed to measure, and whether this measurement, is accurate and precise.

In order to ensure validity, the questionnaire will be further refined along with selected domain experts such as druggist and pharmacists who are working at ART pharmacy and the questionnaire will be pre-tested and adjusted accordingly.

3.5 CONCLUSION

This chapter defined and provided details on the study design and methodology. The researcher discussed sampling approaches and methods and their ethical implications, and the target population. The data collection approach and their ethical consideration were described and the development and testing of the data collection instrument described and also how the data analyzed stated. Finally, internal and external validity of the study was discussed.

CHAPTER FOUR

ANALYSIS, PRESENTATION AND DESCRIPTION OF THE RESEARCH FINDINGS

4.1 INTRODUCTION

This chapter discussed how the collected data was prepared for analysis, description of the data and its presentation.

4.2 DATA MANAGEMENT AND ANALYSIS

The analysis was done by categorizing, ordering, manipulating the data and summarizing in a meaningful way. A statistician was consulted during the study for data management and analysis. Quantitative data were summarized and described using descriptive statistics (Frequency distribution, cross-tabulation, mean, and standard deviation).

Data was checked for missing values and errors and then verify with the source document. The data obtained from each study participants was cleaned to remove omissions and errors. This was edited and entered into a computer using Statistical Package for Social Scientists (SPSS) software for analysis. The results of the analysis were presented in percentages and tabular form. The data was ordered in tables and then frequency and percentage calculated. Analysis of the data was showed based on the study objective and questions.

4.3 RESEARCH RESULTS

In this section the researcher discusses data analysis in the context of the study's objectives.

The pharmacist and druggist who participated in the study were licensed or permitted by Federal Ministry of Food, Medicine and Health Care Administration and Control Authority (FMHACA) to work in different pharmacies. A total of 76 questionnaires were distributed to all dispensers who work or who were working at ART pharmacies. The overall response rate was 100%.

4.3.1 Sample Characteristics

4.3.1.1 Socio demographic details of study subjects

There was a fair gender balance among the respondents with 37 males and 39 females. With respect to their academy or professional category 50 were pharmacist (B.Sc. in Pharmacy) and 26 were druggist (Diploma in Pharmacy) giving a ratio of about 2:1. The respondents had an age range between 24 to 48 years, with an average of 30 years.

Concerning the type of institutions 24 respondents were working at hospitals and 52 are working at health centers. Respondents with 3-4 years formed the largest proportion followed by those who had served 5-6 years as shown in figure 4.1.

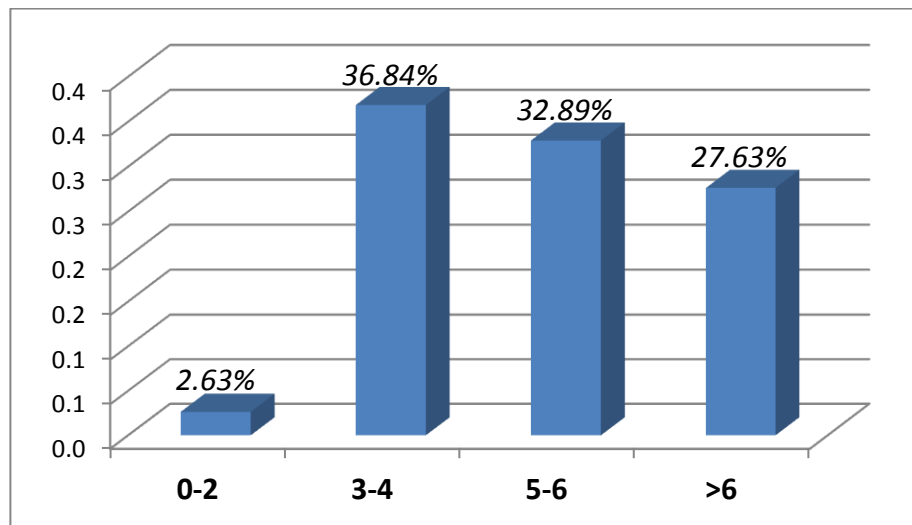


Figure 4.1 Years of Experience at working station

4.3.2. Questions related to information access behaviour in pharmacy practice

When respondents were asked about the way of providing services to patients 26(34.21%) of the respondents used paper based recording, 23(30.26%) of them were using computerized system and 27(35.53%) are using both paper and computer to manage patient and drug related information. Respondents who heard information about PMIS/HMIS were 70 while, the rest 6 had not. All 76 respondents perceived that IT will improve efficiency and effectiveness. Regarding the use of information recorded

17(22.4%) stated for decision making, budgeting and planning purpose and 45(59.2%) to keep patient history electronically, 22(28.9%) to provide feedback for supervisors or donors and 69(90.8%) of them stated for ease of access of patient information. At 30 HFs there is a focal person for HMIS. At 15 HFs pharmacist or druggists are handling pharmacy information system and at 20 HFs data entry clerks are responsible and at 3 sites all pharmacy staffs are responsible for handling pharmacy information management system. Out of 76 respondents 50 have been trained in HMIS while the rest 25 have not been trained. Dispensers are using different information sources to manage dispensing practice. From 76 respondents 20 were using computer only while 26 respondents were using Patient information sheet and drug registry cards and the rest 30 were using both manual and computerized information sources. Response regarding appropriate and convenient tool to manage information, computer based recording is more convenient 47(61.8%) and 29(38.2) stated both computer and manual recording are convenient. Almost all Health facilities in Addis Ababa region produce pharmacy reports and shared for Ministry of health and regional bureau 44.7% and for Regional Health bureau and other concerned parties (supporter NGOs) 55.2% i.e. 34 HFs monthly and 4 HFs on bimonthly basis produce reports. About 23(30.3%) respondents stated that there was a gap between the services they provide and the report generated and 53(69.3%) of them stated no gap. Regarding the possible reasons for this gap 13 respondents stated “information not fully recorded”, 4 respondents stated “data not recorded correctly” and 6 of the respondents stated “information is not recorded fully and correctly” as shown in Table 4.1 below.

Table 4.1 Questions related to information access behavior in pharmacy practice

	Frequency	%
Heard about PMIS	70	92.1
No	6	7.9
How do you review and record patient History?		
Paper based	26	34.2
Electronically	23	30.3
Both manual and computerized	27	35.5
IT will improve efficiency and effectiveness of your work		
Yes	76	100
For what purpose do you use		
For decision making, budget, planning, M&E	17	22.4
To keep patient history electronically	45	59.2
To provide feedback for supervisors or donors	22	28.9
To easily access patient information	69	90.8
Presence of focal person assigned for HMIS at the health facility		
Yes	62	81.6
No	14	18.4
Who is responsible for handling pharmacy information system?		
Pharmacist	8	10.5
Data entry clerks	40	52.6
Both Pharmacist and Druggist	20	26.3
All	8	10.5
Have you been trained on HMIS/PMIS		
Yes	50	65.8
No	25	32.9
Is there a regular on the job training on Pharmacy MIS?		
Yes	42	55.3
No	34	44.7
Who took on the job training? .		
Pharmacist	6	7.9
Druggist	4	5.3
Data Clerk	3	3.9
Pharmacist & Druggist	2	2.6
For All	31	40.8
Appropriate and convenient tool to manage patient and drug related info.		
computer based recording	47	61.8
Both manual and computer	29	38.2
Did you produce pharmacy reports from manual or electronic system		
1. Yes	76	100
To whom do you report the generated reports other than your institution?		
Regional Health Bureau	31	40.8
Ministry of Health	3	3.9
Other concerned parties	8	10.5
Both RHB & other parties	34	44.7
In what interval do you generate reports? .		
Monthly	68	89.5
Bimonthly	8	10.5
Is there a gap between the services you provide & report you generate		
Yes	23	30.3
No	53	69.7
What is the possible reason for the gap?		
Information not fully recorded	13	17.1
Data are not recorded correctly	4	5.3
Data are not recorded fully and correctly	6	7.9

4.3.3. Access for Information Technology

At 35 Health Facilities ART pharmacies, there is a Desktop computer to manage patient and drug related information i.e. 92%, and 3 HFs do not have computers and they are managing information by using manual records. 30 HFs there is telephone for dispensers or data clerks are using for patient follow up and at 8 HF there is no telephone service for patient follow up. Telephone costs are covering by supporter NGOs. 26 HFs has printers and mostly uses for printing monthly reports and stock status reports and at 12 HFs there is no printer and they uses different means to print reports. Out of 38 HFs only 6 HFs are has internet access, the rest are not using internet at HFs. Sources of computers and IT equipment are mostly from NGOs those are working in health system strengthening i.e. 25 HFs or (65.8%) and 10 HFs from both the institutions and NGOs. When Patient load in high, especially some hospitals, dispenser use two computers to manage patient information, in this case the institution provide one computer in addition to NGO provided computer (Table 4.2).

Table 4.2 Access for Information Technology among respondents in Government Hospital and Health Centers Pharmacies in Addis Ababa Region

Characteristics	Frequency	%
Presence of computer at HFs		
Yes	70	92.1
No	6	7.9
Type of Computer		
Desktop	70	100%
Presence of Telephone		
Yes	60	78.9
No	16	21.1
Availability of Printer at Pharmacy		
Yes	52	68.4
No	24	31.6
Access to internet		
Yes	12	15.8
No	64	84.2
Source of Computer and IT equipment		
From NGOs	50	71.4
From both sources	20 3	28.6

4.3.4 Computer experience /skills, practice and challenges

Out of 76 respondents 47 of them are computer trained and the rest 29 are not trained. The reasons for no training are different: 3(3.9%) due to lack of time, 5(6.6%) lack of money, and 7 (9.2%) lack of computer access and 14(18.4%) of them due to lack of opportunity. From the trained persons, 45(95%) of them trained MS Office Application and 2(2.6%) of them are trained on all the listed computer software. All respondents stated interest in working with computers and 53(69.7%) were using information

recording system at their organization, while the rest 23 respondents were not using. More than 75% of dispensers are using electronic dispensing tools always for data entry i.e. managing patient information and for all purpose. 46 dispensers (60%) use computerized system for real time dispensing i.e. reviewing and recording patient history with the presence of patient, by reviewing patient history, updating and dispensing drugs by using automated means.

Regarding challenges related to HMIS 52(68.4%) of them reported lack of coordinated effort and leadership, 34(44.7%) lacks of strategy and policy, 56(73.7%) shortage of skilled manpower, 27(35.5%) lack of guideline and 43(56.6%) reported lack of interest in the use of PIS as shown in the table below (Table 4.3).

Table 4.3 Challenges of Pharmacists and Druggist in related to HMIS in Addis Ababa Government Hospital and Health Centers

Challenges in related to HMIS	Responses (Freq.)
Lack of coordinated effort and leadership	52 (68.4%)
Lack of strategy and policy	34(44.7%)
Shortage of skilled manpower	56(73.7%)
Lack of guideline	27(35.5%)
Lack of interest to use PIS	43(56.6%)

4.3.5 Effects of information system on patient management at pharmacy

Almost all respondents using computers for dispensing agreed or strongly agreed on that information system reduce patient waiting time i.e.66(86.9%), reduce medication error 58(76.3%), reduce workload 72(94.7%), improves quality of patient care 64(84.2%) and 65(85.6%) reported that it helps to keep patient information confidentially. Nearly the same numbers of subjects are not sure about the indicated effects of information system on patient management at pharmacy. Only 1 respondent disagreed that Information system reduce workload and easy to access. Table 4.4 below provides a summary of the above findings.

Table 4.4 Effects of information system on patient management at pharmacy

SN	<i>Effects of information system on patient management at pharmacy</i>	Frequency Distribution				
		Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
5.1	IT reduce patient waiting time	15(19.7%)	51(67.1%)	10(13.2%)		
5.2	IT reduce medication/ dispensing error	15(19.7%)	43(56.6%)	18(23.7%)		
5.3	IT reduce workload and easy to access	15(19.7%)	57(75%)	3(3.9%)	1(1.3%)	
5.4	IT improves quality of patient care	13(17.1%)	51(67.1%)	12(15.8%)		
5.5	IT helps to keep patient information confidentially	11(14.5%)	54(71.1%)	11(14.5%)		

4.3.6 Factors affecting use of information technology

As indicated in Table 4.5, twelve selected variables that were expected to be the possible factors that affect the utilization of information technology for pharmacy service by pharmacists and druggists. The responses were graded from "strongly agree to strongly disagree".

One of the factors affecting the utilization of information technology is lack or inadequacy of know-how/training as indicated by the responses 65(85.5%) strongly agree or agree, 2 respondents not and 9(11.8%) disagreeing. Most of respondents stated that one of the factors that affect the utilization of information technology is shortage of budget, as indicated by the responses 34 (44.8%) agreed or strongly agreed, 27(35.5%) not sure and 13(17.1%) disagreeing with the shortage of budget as a problem. The majority of respondents, 50(65.8%) agreed or strongly agreed with the questions 'Lack of skilled pharmacy personal to use information system' as a problem and 22(28.9%) of them disagreed on this point. Lack of interest to use information technology was another question that was asked. From 76 respondents 44 (57.9%) of respondents agree or strongly agree. Respondents who did not know about lack of policy or were not sure that lack of policy affect the use of IT are 53(70.7%) and 13(17.9%) agreed that there is a lack of policy to use IT. Regarding technology transfer problem 27(35.5%) agreed that there is technology transfer problem, because most

professionals or administrators do not change their work habit or working trend, and they need to continue as they were doing. From 76 respondents 15(19.7%) of the respondents were not sure whether there is a problem or not and 34(44.7%) of them are perceived that there is no problem for technology transfer. One third of the respondents believed that there is lack of management commitment and 25(34.2%) said the management is committed to IT usage at the pharmacy. About 54(71.1%) of the professionals were not aware of the competitive advantage of IT in Pharmacy and 19(25%) of the respondents disagreed, because they believe that most of professional pharmacy staffs are aware of the advantages of IT. Concerning the lack of standards, among 76 respondents 50(64.8%) agreed or strongly agreed that it affected the use of IT in pharmacies, since if there is a standard to use IT for pharmacy services at health facility level, IT usage will be implemented at all pharmacies. The effect of culture on the use of IT was another question and 65(85.5%) responded that there is no culture of utilization of IT. Most of the time information recording at HFs was based on manual records.

Other important issue that was given attention in this study was about respondents' computer phobia or fear of using IT. With respect to this, 11(14.5) agreed that there is a fear of using IT and most of the respondents i.e. 51(67.1%) disagreed with the perception of fear of using IT. This means that they were not phobic or apprehensive to use computer. However, 14(18.4%) were reserved in their attitudes (table 4.5).

Table 4.5. Pharmacists and Druggists attitude on factors affecting the use of IT at ART Pharmacies in Addis Ababa, Ethiopia.

SN	Factors affecting Pharmacy information technology system		Frequency Distribution					Descriptive Statistics	
			Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree	\bar{X}	SD
6.1	Lack or inadequacy of know-how/Training	N	7	58	2	9		3.83	.755
		%	9.2	76.3	2.6	11.8			
6.2	Shortage of Budget	N	5	29	27	13	2	3.29	.921
		%	6.6	38.2	35.5	17.1	2.6		
6.3	Lack of skilled pharmacy personnel to use info. System	N	4	46	2	22	2	3.37	1.044
		%	5.3	60.5	2.6	28.9	2.6		
6.4	Lack of interest or awareness to use information technology	N	2	42	3	25	4	3.17	1.088
		%	2.6	55.3	3.9	32.9	5.3		
6.5	Lack of Policy	N		13	53	7	2	3.03	.615
		%		17.3	70.7	9.3	2.7		
6.6	Technology Transfer problem	N	2	25	15	33	1	2.92	.963
		%	2.6	32.9	19.7	43.4	1.3		
6.7	Lack of Management commitment	N		28	22	25	1	3.01	.872
		%		36.8	28.9	32.9	1.3		
6.8	Not knowing the competitive advantage of IT	N		54	3	17	2	3.43	.929
		%		71.1	3.9	22.4	2.6		
6.9	Lack of standards	N	1	49	23	3		3.63	.585
		%	1.3	64.5	30.3	3.9			
6.10	No culture of using IT	N	2	63	4	4	3	3.75	.768
		%	2.6	82.9	5.3	5.3	3.9		
6.11	Technology/Computer phobia (fear to use technology)	N		11	14	33	18	2.24	.978
		%		14.5	18.4	43.4	23.7		

4.3.7 Questions related to Pharmacy Information System

All respondents reported interest to use pharmacy information system i.e. 30(39.5%) strongly agreed and 46(60.5%) respondents agreed. Among 76 respondents 48(63.1%) agreed that there is a shortage of manpower at pharmacy and 27(35.5%) disagreed on this point. Regarding the adequacy of the existing manual system, most of the respondents i.e. 67(88.2%) disagreed or strongly disagreed. Most respondents 39(51.3%) disagreed with the perception of expensiveness of pharmacy information system and 31(40.8%) of the respondents do not know whether it is expensive or not. Nearly 57(75%) of the professionals know where to get pharmacy information system. 67(88.2%) reported agreeing or strongly agreeing that if there is a pharmacy information system, dispensing time will be saved or reduced while 9.2% had reservation about this point. Table 5 below summarizes these statistics (Table 4.6).

Table 4.6 Professional's response on Pharmacy information system

SN	Pharmacy information system	Frequency Distribution				
		Strongly Agree	Agree	I am not sure	Disagree	Strongly Disagree
7.1	Interest to use pharmacy information system	30(39.5%)	46(60.5%)			
7.2	There is shortage of manpower at pharmacy	2(2.6%)	46(60.5%)	1(1.3%)	25(32.9%)	2(2.6%)
7.3	The existing manual system is adequate		3(3.9%)	6(7.9%)	62(81.6%)	5(6.6%)
7.4	Pharmacy information system is expensive		6(7.9%)	31(40.8%)	34(44.7%)	5(6.6%)
7.5	Administrators of the institution support the use of Pharmacy information system	5(6.6%)	33(43.4%)	20(26.3%)	17(22.4%)	1(1.3%)
7.6	Pharmacy information system saves dispensing time	11(14.5%)	56(73.7%)	7(9.2%)	2(2.6%)	
7.7	Pharmacy information system is complicated to use	1(1.3%)	1(1.3%)	19(25%)	40(52.6%)	15(19.7%)
7.8	Not knowing from where to get Pharmacy information system	1(1.3%)	4(5.3%)	14(18.4%)	50(65.8%)	7(9.2%)

4.4 DISCUSSION OF RESEARCH FINDINGS

This study assessed the use of information technology by pharmacists and druggists at Addis Ababa government health facilities. It is mainly concerned with the self-reported assessment of the professionals.

From 38 Health Facilities or ART sites in Addis Ababa region, at 35 HFs there is a desktop computer i.e. 92% and at 3 HFs there is no computer to manage ART patient and drug related information. Even if there is a computer, at some HFs dispensers or professionals are not using computer to manage patient information, they use manual records and the assigned data clerks are use the computer to enter the data. But at some HFs professionals are using computers and the data clerks manage manual records.

During drug dispensing, as revealed in this study, about 34.21% of the professionals use paper based information recording, 30.26% of them use only computerized system, and 35.53% are using both manual and computer for information recording. Professional using manual recording with electronic system for backup purpose, if there is a data loss from the automated system and to review patient history when there is

power interruption. But they can consider as an electronic site or health facilities they are using computer for information recording i.e. about 65.79%. Therefore, the use of computer system in pharmacies is appreciable, because as compared to one study, about 7% of the professionals used manual recordings for prescription processing on a daily basis. It is clear that IT is advancing and manual recording is being shifted towards the conversion in to electronic system. Nowadays it is considerable that the use of IT helps to improve the efficiency and effectiveness of patient information management, as we can see the rate of the respondents i.e. 100% on the issues that IT will improve effectiveness and efficiency.

Evidently the rate of the respondents, most of the pharmacists and druggists are using the recorded information to access patient information easily, to keep patient information electronically and for decision making. In addition to this, most professionals noted that computer based recording system is more appropriate and convenient to manage patient related information. But there is some gap between the service they provide or the information recorded and report produced. The reason for this gap is; information is not fully and correctly recorded.

At most HFs there is a desktop computer; those are gained from NGO 92.1% and 26.3% from HFs for the purpose of ART patient relation information management when their patient load increases the HF will add one computer and then by using two or more computer via networking. Health Facilities (HFs) are using telephone to follow up patient status. When patients lost from treatment, the assigned personnel i.e. case workers will call to the patient or to the supporter (spouse, brother, sister, mother, father of the patient) to know the status of the patient, then they will get an information whether the patient is lost, dead or stop treatment for decision making. For this purpose NGOs will support 30 HFs to cover the cost of telephone services.

Among 76 respondents most professionals are stated the advantages of using information technology for patient information management by reducing patient waiting time i.e. 86.8%, since searching patient information on the computer system easy and fast rather than selecting patient cards from cabinets, reading two or more cards that keep one patient information, and it reduce medication error 76.3%, since the

automated system help to dispense the right medicine to the right person and in turn minimize patient harm since the system display only related medicines and also it reduce workload 94.7%, as it can generate reports on time, and it improves quality of patient care 84.2% meanwhile the dispensing practice is done by counseling the patient, recording if there is any additional information on medicines adverse drug reaction, drug cha and 85.6% stated that It helps to keep patient information confidentially as automated system is better than manual system to keep patient history by using password and the database not visible for unauthorized person.

In this study, almost all professionals have an interest to use pharmacy information system. It implies that they acknowledge the advantages of IT in pharmacy practices, but they perceived that there is a shortage of manpower at ART pharmacies. At health Facilities there are four or five types of pharmacies i.e. Inpatient pharmacy, outpatient pharmacy, ART pharmacy, Emergency pharmacy and so on. This depends on the hospital or health center budget or patient load the type of pharmacies present is different. So, dispensers provide service for all pharmacies at HF. Only ART trained personnel has to assign at ART pharmacy. Due to this there is only one or two dispensers being assigned.

Professionals stated that the existing manual system is not adequate respondent i.e. 88.2% of them disagree with this point, since the patient load is increasing from time to time, managing information recording by manual records will be difficult.

The pharmacy information system provided by supporter NGO i.e., Management Science for Health (MSH) freely, so, most respondents 51.3% says it is not expensive, some professionals 40.8%, didn't know whether it is expensive or not. To this, nearly 72.3 of the professionals know where to get pharmacy information system. And among the total respondents 88.2% reacted positively if there is a pharmacy information system, dispensing time will be saved or reduced.

As stated above, though the professionals have a willingness to use computer system, the exploitation of IT in general seems high in pharmacy practice in Addis Ababa government health facilities and there are also many constraining challenges as revealed in the study.

Some constraining factors that had been revealed through this study include lack of knowhow/training of the professionals, lack of skilled manpower, lack of finance or budget for pharmacy personnel capacity building, shortage of standard to use IT at all HFs, technology transfer problem and lack of management commitment were some of the factors that affected the use of information technology by professionals.

Finally, even though there is a shortage of skilled or trained personnel at pharmacy the utilization of IT by pharmacists and druggist is appreciable.

4.5 CONCLUSION

In this chapter the preparation, management and analysis of data was presented. The researcher discussed how the data was prepared, described the sample's main characteristics, explored the data through tables and graphs, confirmed the data guided by the objectives and questions of the study, and interpreted the study findings.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

In this chapter the researcher discussed conclusions made from the study findings, highlights the limitations of the study and makes recommendations based on the problem stated.

5.2 RESEARCH DESIGN AND METHOD

The current research study intention is to assess the utilization and availability of pharmacy information management system at government health facilities in Addis Ababa Region. The findings and recommendations discussed in this chapter aim to influence practice and strategy to adopt the system.

The purpose of the study was to assess the availability and utilization of Pharmacy HMIS at Addis Ababa region government health facilities. The study address this purpose by meeting the objectives, describing factors that affect the utilization of information technology and assessing users preference for manual records or automated system.

A quantitative, descriptive research design was used for the current study. Data was collected from all ART pharmacies at government HFs by using questionnaire.

The study findings were discussed as follows.

5.3 SUMMARY AND INTERPRETATION OF THE RESEARCH FINDINGS

5.3.1 Demography of the population

The subject consist almost equal proportion of female and male. Age distribution is below 40 years of age and most participants are falls down age 20's because most of the time recently there is a chance to take ART training at pharmacy schools specially for graduating class. Most subjects had been working in the ART pharmacy for more than two years.

5.3.2 Electronic information recording at Public Health Facilities ART pharmacies

(Information access behavior in pharmacy practice and Information technology access)

Most of the subjects used computerized recording system even if some of them are using both computer and manual records, it counts as computerized recording system applied since they are using manual records as a backup purpose, i.e. they used manual records in addition to computer to get a backup whenever there is a total loss of the database or the system and they refer patient history when there is no power at the facility. But some participants are depend on only computers, these sites has generator to protect power interruption and using proper back up to protect data loss. Almost all subjects feel that IT will improve efficiency and effectiveness of pharmacy practice. Pharmacists and Druggists at HFs ART pharmacy are using the recorded information for decision making, to keep patient history electronically and to make easily accessible. Most dispensers believe that computer base recording is more appropriate and convenient, but since they are busy by their routing dispensing practice, they are not using as expected. Regarding report generation, almost all HFs in Addis Ababa Region produce pharmacy report and shared for Ministry of Health and Regional Bureaus. But some respondents felt that there is a gap between the services they provide and the report generated. The possible reasons for the gap are that information not recorded fully and correctly. If information was not recorded fully and correctly, it will be difficult to review patient history and making decision. The assigned person at ART pharmacy or other pharmacies in the HFs must recorded full patient information whether electronically or on manual records correctly.

5.3.3 Computer experience /Skills and Software use

Even though most users were trained computer, it is concerning that some of them are not trained due to lack of opportunity, time and access. All subjects are interested working with computer and using information recording system at their working place always for patient related data management and 60% of the dispensers are use computerized system for real time dispensing by reviewing and recording patient history in the presence of patient, council the patient after reviewing their history and update the dispensed drug by using automated means. To implement this system there are

many challenges faces, lack of strategy and policy, shortage of skilled manpower and lack of guidelines are some of the challenges stated. Since using computers for every activity has an advantage, professionals must train and use computers by getting a solution for the challenges. Specifically Regional Health Bureaus have a mandate to set strategy and policy and also arrange appropriate training.

5.3.4 Advantage of Information Management System ART Pharmacy

Most of the subjects confirmed that the attributes of Pharmacy Information System were beneficial to their pharmacy practices. Dispenser at ART pharmacy feel that using Pharmacy Information System reduce patient waiting time and it saves pharmacists time too by reducing handwriting issues, reduce medication error since they were reviewing patient's medication history before dispensing , so dispensing wrong medicine can be controlled, and the system can reduce workload, since searching patient card from one or two cabinets and bunches of file holders is difficult and time consuming, but rather using automated system is easy to search patient medication information by typing their name or clinic ID, and it improve quality of patient care and patient information confidentiality. Delegation of routine and time consuming tasks to a computer allows pharmacists to concentrate on the clinical aspects of the practice.

5.3.5 Factors affecting use of information technology

Information Technology at pharmacy practice has many advantages. But there are different factors that affect the access and utilization information technology. Despite of other factors that affect the utilization of information technology most subjects felt that lack or inadequacy of know-how/training is the most. Shortage of budget for IT training for pharmacy staff and lack of management commitment is another factor to use IT. At most HFs large amount of time and financial investments were made by supporter NGO in order to successfully implement information technology.

Lack of skilled manpower and interest to use information technology is stated as a problem, most trained or skilled staffs are transferred to higher position and they are not involved for routine dispensing activities and there is less interest to use automated system due to that they consider as an additional work and as it is a new system of work and there was no culture of using IT at HFs. It is common for health care providers

to experience frustration as the transition to better technologies is being made, resulting in many. Even after new technologies are in place, issues such as lack of interoperability between systems and devices are very common.

This results in suboptimal realization of the intended value of many technologies. According to Kim Galt and Roger F (2008: 15), *The “theoretical’ benefits of technology implementation into practice may not always be fully realized, or are realized slower than expected”*. Even if there is an awareness regarding the competitive advantage of IT in pharmacy, there is lack of standards and policy at higher level to implement pharmacy information system at all ART sites in Addis Ababa Region. And also Regional Health Bureau has set a policy and standards on how to manage ART patient information recording and handling. To create an effective Health Information System, governments must support the system, create the necessary policy environment (for example, through legislation and regulation), and develop systems and services for the collection, collation, dissemination and use of health information or the use of IT for health care services.

5.3.6. Pharmacy Information System

The introduction of new technologies into health care delivery is an increasingly and ever growing aspect of the pharmacist’s daily work. Many of these new technologies are oriented toward preparation, dispensing, administering or managing medication used.

The major factor in the successful implementation of a computer system is the degree to which users accept the system. In our case all dispensers have an interest to use pharmacy information system and they know that the existing manual recording is not adequate, but there is a shortage of manpower at the ART dispensary. At one health facility there are different kinds of dispensary outlets, some of them are: Out-patient pharmacy, In-patient pharmacy, Emergency Pharmacy, ART pharmacy and so on. At HFs pharmacists assigned at these pharmacy outlets by shift or round in three or six months interval they changed from one pharmacy to another pharmacy at same HF. Most of the time there were two dispensers at ART pharmacy, but when there is a shortage of manpower at other dispensaries at the HF another pharmacy, they will go there and dispense. And also pharmacists will be busy by other office duties or out to

bring medicines from Pharmaceutical Fund Supply Agency (PFSA). Due to these reasons there are not enough dispensers at HFs. Most professionals felt that pharmacy information system saves dispensing time and it is freely available from the supporter NGO, so they have a good impression to use the system despite they are busy by their routing activities i.e. make sure the availability of enough drugs at mini store and take time for patient counseling. *Successful computerization in pharmaceutical management can greatly increase an organization's efficiency, productivity and capabilities. But it must be carefully planned. Expensive mistakes are easy to make through a lack of knowledge or forethought, hindering rather than helping a project (MSH: 2012).*

5.4 CONCLUSIONS

The conclusion is discussed in respect of the study question, objectives and the problem statement. The problem statement is “do pharmacists and druggists at ART pharmacy take advantage of information technology in their drug dispensing practice?” The purpose of the study, therefore, was to assess the current status of ART pharmacy implementation of pharmacy information system, explore the effects of IT and study factors affecting the use of IT. This purpose was achieved through meeting the study objective.

Most respondents were pharmacists and druggists who are working at ART pharmacies in Addis Ababa government health facilities. The majority of the respondents are pharmacists with B.Sc. Degree in Pharmacy. And most respondents perceived the advantages of using IT at pharmacy.

The study specified better utilization status of IT for pharmacy practice services in Addis Ababa, Ethiopia. The findings indicated that there is an access for information technology at dispensaries and used by most of the dispensers and also they believe that using information technology to manage patient and drug related information is appropriate and convenient. The findings also indicate the need for computer training related to pharmacy profession and also setting standards for IT use in health care system, particularly in pharmacy practice. IT usage awareness creation among the professionals is necessary to give them more skill oriented and formal in-service trainings for the professionals. Additional points are mentioned as follows:

-There are factors that affect the use of IT for practicing pharmacy service level. Some of them are: lack of management and professional's commitment, lack of training or capacity building, not knowing the advantages of IT in proper way and lack of culture to use IT.

These technologies have the potential to improve both patient care and patient safety. Medical errors and issues of safety are hardly new phenomena. Even during the drawing of medicine. In the US, efforts to improve the quality of health care can be seen in almost every decade of the last century (Garets & Davis 2005).

5.5 RECOMMENDATIONS

To improve generalizability a study population should be bigger and include other regions respondents. To improve richness and depth of the data qualitative study using open-ended questionnaire or interview is recommended.

The study findings and conclusions found that, pharmacy information management system has advantages. These findings will be communicated to the Regional Health Bureaus at local level where the health facilities located. The aim is to bureaus to influence on the implementation and use of information technology by pharmacists or druggist to apply real time dispensing. And also this experience will be shared for other regional health facilities nationally.

Users who are satisfied with a system and who see the benefits thereof can act as change agents for others. They can promote innovations and influence the opinion of other who is depending on the manual system. The witnesses of the experienced users of the system are more valuable than others, so experience sharing between facilities is necessary.

5.6 CONTRIBUTIONS OF THE STUDY

This study will contribute to strengthen pharmacy information management system. It is part of capacity building activities among other pharmacy practices. The findings will strengthen policies and practices of pharmacy information management system in the

Regional Health Bureaus, leading to a more informed approach in adopting and implementing the system.

The frequency of the use of computer by dispenser is leads to familiar to the system, searching patients, reviewing a specific patient medication history, dispensing and filling other drug related information of patients is used mostly. This data can further benefit the patient by being used in research to improve pharmaceutical services and reduce error. User can also contribute to improve the performance of the system with suggestions which needs to be added or improved.

The study had emphasized weaknesses of dispenser's implication regarding the implementation and utilization of pharmacy information management system. Even if they are busy by their routine dispensing practice and prefer to provide drugs to patients without reviewing and updating patient history, it is useful that using automated means like computerized database system to manage patient information.

5.7 LIMITATIONS OF THE STUDY

The study design was mainly descriptive and contextual. The findings of the current contextual study have limited generalizability. A self- administered and close ended questionnaire was used and it may limit the opinions of the respondents. There is no selection bias since the researcher used the whole population as a target population and information bias was reduced by implementing the questionnaire the same way on all subjects.

Since the study area is limited to one region i.e. Addis Ababa, it doesn't cover the whole ART sites nationally.

Joubert and Ehrlich (2007:165) argue that confounding is not concern in purely descriptive studies, like the current study, that do not examine the association between variables.

5.8 CONCLUDING REMARKS

Improving pharmacy information systems is to integrate pharmaceutical data collection processing and presentation of information to help staffs at all levels of country's health system make evidence based decision to manage health and laboratory commodities pharmaceutical services

The objective of the researcher is to assess the presence and utilization of IT and identify factors that affect the adoption, utilization and implementation of health information system in the health facilities pharmacies.

As we can see the analysis result, there is computers at most health facilities, but regarding their utilization of information technology to manage ART patients and their medication data, is poor at some health facilities and some HFs are using IT properly to manage patient information. Regarding factors affecting the utilization of IT, there are many factors that affect the implementation of HMIS due to different reasons. From the information gathered from the analysis of the respondents answered in this point, lack of interest, committeemen, not culture of using IT, lack of training, shortage of manpower and so on are most factors that affect the adoption and utilization of IT.

The study was conducted to improve pharmacy management information system. The specific target is ART pharmacy at government health facilities. The benefits of pharmacy information system as identified and confirmed in this study will lead to more broad studies and the findings aim to influence policy and practice to Regional Health Bureaus and lead to wider adoption and implementation of pharmacy HMIS nationally. Regional Health Bureaus and health facilities can coordinate to implement this system at all health facilities and for greater sustainability, RHBs are trying to incorporate PMIS i.e. patient information handing by using computerized system in the job description of dispensers. And all health facilities have to adopt standardized information management system.

References:

ART Dispensing Tool User guide, August 2007

Biohealthmatics. Hospital Information Systems. From:
<http://www.biohealthmatics.com/technologies/intsys.aspx>. (Accessed Nov. 2012)

Ball, MJ, Garets, DE & Handler, TJ 2003. Leveraging Information Technology towards enhancing patient care and a culture of safety. *Methods of Information in Medicine*.

Braa. Born and etal. (2007). *Developing Health Information Systems in Developing Countries: The flexible Standard strategy*. MIS Quarterly Vol. 31 Special Issue.

Building Conceptual and Theoretical Frameworks that Inform Research Neil A. Knobloch, Purdue University.

Developing Pharmacy Practice: A focus on Patient Care, Karin Wiedenmayer, Swiss Tropical Institute, Basel, Switzerland, Rob S. Summers, School of Pharmacy, University of Limpopo, MEDUNSA Campus, South Africa: (2006).

Drug administration and control Authority of Ethiopia, standard treatment guidelines; pp. 1–3. Ethiopia: (2004).

Developing Health Management Information System: A practical guide for Developing Countries: WHO (2004).

Demographic and Health Survey. Addis Ababa, Ethiopia (2011).

Ethiopian Federal Ministry of Health; guideline for implantation of the antiretroviral therapy program in Ethiopia: (2007).

Electronic Health Records Overview: MITRE (2006).

Evidence-based Information from Pharmacies Improves ART Guidelines.

January 30, 2013: ([Http: siapsprogram.org/2013/01/30/evidence-based-information-from-pharmacies-improves-art-guidelines/](http://siapsprogram.org/2013/01/30/evidence-based-information-from-pharmacies-improves-art-guidelines/)).

Evidence based Midwifery: Professor Marlene Sinclair, Editor

Federal Ministry of Health. Health Sector Development Program (HSDP) IV, 2010/11 – 2014/15. Final Draft, October 2010, Addis Ababa

Federal Democratic Republic of Ethiopia. Population Census Commission and Statistical Report of the 2007 Population and Housing Census. Central Statistics Agency. Addis Ababa, (2008).

Federal Ministry of Health of the Government of Ethiopia and U.S Agency for international Development. Strengthening Pharmaceutical Management Information Systems at Antiretroviral Pharmacies.

<http://www.msh.org/projects/rpmpplus/wherework/Africa/Ethiopia>.

Guidelines for the Development of Pharmaceutical Services in Primary Health Care: Pan American Health organization: Washington, (June 2011).

Guidelines for implementation of HIV/AIDS Case Management in Ethiopia (June 2009:1)

Gebu Gebru and Tegbar Yigzaw.(2006) *Research Methodology, lecture note for health science students*

Global Observatory for eHealth -Ethiopia /
http://www.who.int/goe/data/country_report/eth.pdf) pp 119.

HAPCO and World Bank, HIV/AIDS in Ethiopia: an epidemiological synthesis, 2008. Handbook of Institutional Pharmacy Practice, 4th Edition-Pharmacy Information System (Rowell Daniels, Thomas R. Brown: 311-345).

Informatics in Primary Care: Implementing electronic medical record systems in developing countries: Hanish SF Freser: (2005).

Introduction to Research and Research Methods: Bradford University School of Management.

Information to Improve Decision Making for Health: Sally K. Stansfield, Julia Walsh, Ndola Prata, and Timothy Evans.

Joubert, G and Ehrlic, R. (2007). *Epidemiology. A Research Manual for South Africa*. 2nd edition. Cape Town SA. Oxford University Press, 77-93

Joint United Nations Program on HIV/AIDS. (2010). Joint United Nations Program on HIV/ AIDS Global Report: UNAIDS Report on the Global AIDS Epidemic 2010. *Report*. Geneva.

Management Sciences for Health (2011): *Pharmaceutical Management Information System*

Medical Informatics, Computer Applications in Health Care: Shortliffe & Wiederhold.

Ministry of Health Official web site www.fmoh.gov.et (Accessed Jan. 2013)

Operations Manual for staff at primary health care centers: WHO

Original Research: e-Health Readiness Assessment Tools for Healthcare Institutions in Developing countries. Shariq Khoja, M.D., Ph.D., Richard E. Scott. Ph.D

Online journal of Public Health Informatics: Published on 2012 Dec. 19 Understanding HMIS Implementation in a Developing Country Ministry of Health Context – an Institutional Logics Perspective

Pharmacists for patient safety: Kim Galt, RP Roger F. Kaczmarek, RP ,Pharmacist , Creighton Health Services Research Program Chairperson, Board of Pharmacy, Dec (2008): pp 15.

Sitirios Sarantakos (2005): *Social Research* 3rd edition

Sources of PMIS and computer in MDS-3: Managing Access to Medicines and Health Technologies: MSH: Martha Embrey: Julie Frye, MSH, USA

The *Federal Democratic Republic of Ethiopia. The National Information and Communication Technology Policy and Strategy.* Addis Ababa: (August 2009).

UN Country Data, accessed online (www.un.org/popin/region/africa/ethiopia). Ethiopia What are the Major Ethical Issues in Conducting Research? Health Science Journal: Volume 5 Issue 1 (2011). Georgia Fouka & Marianna Mantzorou

ANNEXURE A: CLEARANCE CERTIFICATE FROM UNISA

**UNIVERSITY OF SOUTH AFRICA
Health Studies Higher Degrees Committee
College of Human Sciences
ETHICAL CLEARANCE CERTIFICATE**

HSHDC/103/2012

Date: 29/11/2012

Student No: 46352775

Project Title: **Implementation of ART Pharmacy Management Information System in Public Health Facilities**

Researcher: DERSEH M.A

Degree: Masters in Public Health

Code: DIS4953

Supervisor: Prof Stephen Okeyo
Qualification: PhD
Joint Supervisor: N/A

DECISION OF COMMITTEE

Approved



Conditionally Approved



pp

**Prof L Roets
CHAIRPERSON: HEALTH STUDIES HIGHER DEGREES COMMITTEE**

P.P.

**Dr MM Moleki
ACTING ACADEMIC CHAIRPERSON: DEPARTMENT OF HEALTH STUDIES**

PLEASE QUOTE THE PROJECT NUMBER IN ALL ENQUIRES

ANNEXURE B: REQUEST OF PERMISSION TO CONDUCT THE STUDY

To: Addis Ababa Health Bureau

Request for cooperation

Dear Sir/Madam,

My name is Mekdes Alemayehu Derseh I am a student of UNISA (University of South Africa) and I am studying MPH (Masters of Public Health specialized in Medical Informatics). Currently I am conducting my research on *Implementation of ART Pharmacy Management Information System in Public Health Facilities in Ethiopia*. The purpose of the study is to assess the ART Pharmacy Management Information system with a view of recommending improvement of pharmacy services.

My preferred study setting for the above mentioned topic is Public Health Facilities ART pharmacy in Addis Ababa Region; as primary researcher I can guarantee you that the health personnel information will be kept at highest level of confidentiality. All the data will be stored in a safe place under lock and key and a password protected computer. Only the researcher has an access to the data. The data will be kept for five years. Data will be destroyed by deleting all computer files and the hard copies will be shredded.

I will share the finding of this study once the outcome is approved by the academic commission of UNISA.

Therefore, I am requesting your cooperation to grant me your permission to collect data to do this study from the health facilities those are providing ART Service in Addis Ababa Region.

Sincerely,

Mekdes Alemayeh Derseh

ANNEXURE C: CLERANCE CERTIFICATE FROM REGIONAL HEALTH BUREAU

የአዲስ አበባ ከተማ አስተዳደር የጤና ቢሮ
The Addis Ababa City Administration
Health Bureau

Reference A.A.H.B/3576/227
Date 30/11/13

To Minilik Hospital
To Ras Desta Hospital
To Zewditu Hospital
To Yekatit Hospital
To Gandhi Hospital
To Akaki Health Center
To Kaliti Health Center
To Arada Health Center
To Nifas Silk Lafto woreda 19 Health Center
To Nifas Silk Lafto woreda 23 Health Center
To Kolfe Health Center
To Kotebe Health Center
To Selam Health Center
To Kassanchis Health Center
To Kirkos Health Center
Addis Ababa

To kebena Health Center
To Yeka Health Center
To Kotebe Health Center
To Entoto no 1 Health Center
To Gulele Health Center
To Shiromeda Health Center
To Beletshachew Health Center
To Lideta Health Center
To Teklehaimanot Health Center
To Saris Health Center
To Bole 17/20 Health Center
To Bole 17 Health Center
To Addis ketema Health Center
To Addis Ketema woreda 7 Health Center
To Prison Administration

Subject; Request to access Health Facilities to conduct approved research

This letter is to support Mekdes Alemayehu to conduct research, which is titled as "Implementation of ART Pharmacy Management Information System in Public Health Facilities".

The study proposal was duly reviewed and approved by UNISA Ethical Clearance Committee, subsequently reviewed and approved by Addis Ababa Health Bureau IRB, the principal investigator is informed with a copy of this letter to report any changes in the study procedures and submit an activity progress report to the Ethical Committee as required.

Therefore we request the health facility staff to provide support to the principal investigator.

With Regards

Dr Tadesse Ayalew

Dr Tadesse Ayalew
Head, Ethical Clearance committee

Cc: To Mekdes Alemayehu
Addis Ababa
Ethical Clearance Committee
Addis Ababa



ETHICAL REVIEW COMMITTEE

Tel: + 251 115 513911

P.O. Box 30738

Fax No. +251 115 515689

Research title:Principal Investigator:

Meekdes Alemahu

CRITERIA/ITEM	RATING
1. consent form Does the consent contain all the necessary information that the subject should be aware of?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Requires revision <input type="checkbox"/> No <input type="checkbox"/> Not applicable <input type="checkbox"/> Not attached
2. Are the objectives of the study clearly stated?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
3. Are provisions to overcome risks well described and accepted? a. Justice b. Beneficence c. Respect for a person	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not well described <input type="checkbox"/> Not applicable
4. Are the safety procedures in the use of vaccines, drugs and other biological Products acceptable?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not applicable
5. Are the procedures to keep confidentiality well described?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
6. Are the proposed researchers competent to carry out the study in a scientifically sound way?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable <input type="checkbox"/> Unable to assess
7. Does it have material transfer agreement?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not applicable
8. Recommendation	<input type="checkbox"/> Approved with condition <input checked="" type="checkbox"/> Fully Approved
9. Remarks	

Ethical Clearance Committee Members;

Name

1. Dr Tadesse Ayalew
2. W/ro Frie Hailu
3. W/ro Hana Kumssa

Signature



ANNEXURE D: QUESTIONNAIRE

Part 1. Socio demographic details of study subjects

General Information

Name of the institution _____ Code _____

Please make a circle on the number of your choice under the response column

SN	Question	Response
1.	Sex	1. Male 2. Female
2	Age in years	-----
3	What is your professional Category	1. Pharmacist 2. Druggist
4	What type of institution are you currently working in?	1. Government Hospital 2. Government Health Center
5	Years of experience in the profession	-----

Part 2: questions related to information access behavior in pharmacy practice

SN	Question	Response
1	Have you ever heard about PMIS (Pharmacy Management Information System)?	1. Yes 2. No
2	How do you review and record patient History?	1. Paper based (manual records) 2. Electronically (computerized system) 3. Both manual and computerized
3	Do you think that the use of information technology will improve efficiency and effectiveness of your work	1. Yes 2. No
4	For what purpose do you use the information recorded	1. For decision making, budget, planning, M&E 2. To keep patient history electronically 3. To provide feedback for supervisors or donors 4. To easily access patient information
5	Is there a focal person assigned for HMIS at the health facility	1. Yes 2. No
6	Who is responsible for handling pharmacy information system?	1. Pharmacist 2. Druggist 3. Data entry clerks 4. Both Pharmacist and Druggist 5. All 6. Others
7	Have you been trained on HMIS/PMIS	1. Yes 2. No
8	Is there a regular on the job training on Pharmacy MIS?	1. Yes 2. No
9	If Yes, who took on the job training?	1. Pharmacist 2. Druggist 3. Data Clerk 4. 1 & 2 5. For All
10	Which information tools do you mostly used to manage	1. Patient information Sheet

	dispensing practice and information recording?	2. Drug registry card(Bin card/stock card) 3. Computer 4. 1&2 only 5. All
11	Which one of the above listing information recording tools is more appropriate and convenient to manage patient and drug related information.	1. computer based recording 2. Manual recordings 3. Both manual and computer are convenient 4. none of them
12	Did you produce pharmacy reports from manual or electronic system	1. Yes 2. No
13	To whom do you report the generated reports other than your institution?	1. Regional Health Bureau 2. Ministry of Health 3. Other concerned parties 4. 1&3
14	In what interval do you generate reports?	1. Daily 2. Weekly 3. Every two weeks 4. Monthly 5. Bimonthly
15	Do you feel any gap between the services you provide and the report you generate with the available data?	1. Yes 2. No
16	If your answer is Yes, what is the possible reason for the gap?	1. Information not fully recorded 2. Data are not recorded correctly 3. Data are not properly compiled 4. All

Part 3: Information technology access

SN	Questions	Response
1	Do you have a computer in your organization to manage pharmacy information system	1. Yes 2. No
2	If Yes, What type of computer do you have	1. Desktop 2. Laptop 3. Palmtop 4. Personal Digital Assistance (PDA)
3	Do you use telephone for Patient follow up	1. Yes 2. No
4	Is there printer in the pharmacy	1. Yes 2. No
5	Do you have access to internet in the pharmacy	1. Yes 2. No
6	Where did you get the computers and other IT equipment	1. from the institution 2. from NGOs 3. from both sources 3. other

Part 4. Computer experience /skills, practice and challenge

SN	Questions	Response
1	Have you taken computer training?	1. Yes 2. No
2	If Q 1 is no, what is the reason?	1. Lack of time 2. lack of money 3. Lack of interest 4. Lack of computer/access 5. Lack of Opportunity
3	If Q1 is Yes, what type of computer/ software skill do you have	1. MS Office Application 2. MS SQL 3. SPSS 4. Other 5. All
4	Are you interested working on computer	1. Yes 2. No
5	Do you use electronic Information recording system in your organization?	1. Yes 2. No
6	How often do you use computer at your working place	1. Always 2. often 3. seldom 4. Never
7	For what purpose do you use the computer at the pharmacy?	1. For data entry purpose/ to manage patient information 2. To write a letter of some document. 3. for all purpose 4. not used
8	Do you use computer for prescription processing or for real time dispensing?	1. Yes 2. No
9	What your challenges are in related to HMIS?	1. lack of coordinated effort and leadership 2. lack of strategy and policy 3. Shortage of skilled manpower 4. lack of guideline 5. lack of interest to use PIS 6. all

Part 5: Effects of information system on patient information management at pharmacy

Among the options provided, please select one that closest to your view in regards to the advantages and benefits of using information system at pharmacy and circle your choice

1. Strongly disagree; 2. Disagree; 3. I am not sure; 4. Agree; 5. Strongly agree

SN	Description	Options
1	It reduces patient waiting time	1 2 3 4 5
2	It reduce medication/ dispensing error	1 2 3 4 5
3	It reduce workload and easy to access	1 2 3 4 5
4	It improves quality of patient care	1 2 3 4 5
5	It helps to keep patient information confidentially	1 2 3 4 5

Part 6: Factors affecting use of information technology

Among the options provided, please select one that closest to your view in regards the use of information technology and circle your choice

1. Strongly disagree; 2. Disagree; 3. I am not sure; 4. Agree; 5. Strongly agree

SN	Description	Options				
1	Lack or inadequacy of know-how/Training	1	2	3	4	5
2	Shortage of Budget	1	2	3	4	5
3	Lack of skilled pharmacy personnel to use information system	1	2	3	4	5
4	Lack of interest or awareness to use information technology	1	2	3	4	5
5	Lack of policy	1	2	3	4	5
6	Technology Transfer problem	1	2	3	4	5
7	Lack of Management commitment	1	2	3	4	5
8	Not knowing the competitive advantage of IT	1	2	3	4	5
9	Lack of standards	1	2	3	4	5
10	No culture of using IT	1	2	3	4	5
11	Technology/Computer phobia (fear to use technology)	1	2	3	4	5

Part 7: Questions related to Pharmacy Information System

Among the options provided, please select one that you prefer the most and circle you choice

1. Strongly disagree; 2. Disagree; 3. I am not sure; 4. Agree; 5. Strongly agree

SN	Description	Options				
1	I need to use pharmacy information systems	1	2	3	4	5
2	There is shortage of manpower at pharmacy	1	2	3	4	5
3	The existing manual system is adequate	1	2	3	4	5
4	Pharmacy information system is expensive	1	2	3	4	5
5	Administrators of the institution support the use of Pharmacy information system	1	2	3	4	5
6	Pharmacy information system saves dispensing time	1	2	3	4	5
7	Pharmacy information system is complicated to use	1	2	3	4	5
8	Not knowing from where to get Pharmacy information system	1	2	3	4	5